THE additions to the Zoological Society's Gardens during the past week include a Common Rhea (*Rhea americana*) from South America, presented by Mr. A. D. M. Stewart; a Mountain Ka Ka (*Nestor notabilis*) from New Zealand, presented by Dr. A. de Lantour, M.R.C.S.; an Undulated Grass Parrakeet (*Melopsittacus undulatus*) from Australia, two Californian Quails (*Callipepla californica*) from California, two Common Quails (*Coturnix communis*), a Greenfinch (*Ligurinus chloris*), a Goldfinch (*Carduelis elegans*), two Chaffinches (*Fringilla cœlebs*), two Common Crossbills (*Loxia curvirostra*), a Common Lapwing (*Vanellus cristatus*), British, a Barred Dove (*Geopelia striata*), a Nutmeg Bird (*Munia undulata*) from India, two Rufous-necked Weaver-Birds (*Hyphantornis textor*) from West Africa, two Mecca Pigeons (*Columba œnas*, var.), from Tunis, presented by Mr. H. H. Johnston; a Green Turtle (*Chelone viridis*) from West Indies, presented by Mr. J. C. Robinson, R.M.S. *Dunrobin Castle;* a Common Viper (*Viper berus*), two Common Snakes (*Tropidonotus natrix*), British, presented by Mr. J. Poyer Poyer; a Red-faced Saki (*Brachyurus rubicundus*), a Horrid Rattlesnake (*Crotalus horridus*) from South America, a Brown Bear (*Ursus arctos*) from Spain, a Great Kangaroo (*Macropus giganteus*), two Ursine Dasyures (*Dasyurus ursinus*), three Vulpine Phalangers (*Phalangista vulpina*) from Australia, deposited; a Beisa Antelope (*Oryx beisa*), a Banded Ichneumon (*Herpestes fasciatus*), a Squirrel-like Phalanger (*Phalangista sciureus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

THE SOLAR PARALLAX.—M. Puiseux, in a communication to the Academy of Sciences of Paris, discusses the numerous micrometrical measures made during the last transit of Venus by MM. Mouchez and Turquet at St. Paul's, and MM. Fleuriais and Bellanger at Pekin. If these observations had possessed a high degree of precision he considers that they would have furnished a very exact value of the solar parallax, but unfortunately, so far at least as regards the measures at St. Paul's Island, the conditions were extremely unfavourable; indeed in a note which follows M. Puiseux's communication Admiral Mouchez remarks that the equatorials provided for that station had no special appliances for this class of observation, and worse still, "les observations ont été faites exactement au moment du passage du centre d'un violent cyclone, pendant la courte éclaircie qui accompagne la plus grande dépression barométrique." The instruments in fact were more particularly adapted to proposed observations of contacts, and were very weakly mounted; oscillations were occasioned by the violent wind, so that the practised observers had no confidence in their results. Notwithstanding these circumstances M. Puiseux has discussed the measures, and from the combination which he regards as the most favourable, where 81 observations that appear affected with considerable errors are rejected, leaving 312 measures for calculation, he deduces for the value of solar parallax 9"·05: the mean value of the corresponding residuals is 0"·78, and the extreme residuals − 1"·98 and + 2"·15. Considering that under such disadvantageous conditions the observations accord passably, M. Puiseux thinks there are reasonable grounds to expect that with firmly-mounted instruments micrometrical measures may be obtained at the approaching transit in 1882, which will furnish a pretty exact value of the sun's parallax.

THE DOUBLE-STAR HERSCHEL 3945.—The double-star to which Mr. Birmingham drew attention in NATURE last week on the score of contrasted colours of the components and variability of the principal star has a longer history than is noted in his letter. It is found as a single star of sixth magnitude in Bode's Catalogue, from his own observation, and is Canis Majoris 164. Lalande observed both components on March 2, 1798, magnitude 5 and 7. On January 23, 1835, Sir John Herschel, observing at the Cape, calls them 7 and 8, "large star orange: small, pale blue": and on January 31, 1837, he estimated the magnitudes the same: "large star, very high yellow; small, contrasted blue"; these observations occur in Sweeps 532 and 768. Amongst his micrometrical measures we find for the epoch 1837·153 magnitudes 6½ and 7, and for 1837·301 magnitudes 6½ and 8, with the note "Orange and green, fine contrast of colours." Next we have three meridian observations of the principal star by Argelander in vol. vi. of the "Bonn Observations," on January 26 and March 13 and 14, 1854, magnitudes noted, 5·5, 4·5, and 5·0, and one observation of the companion on March 23 in the preceding year, when it was estimated 7·5. In Heis and Argelander the naked-eye estimate is 5 m. The components are separately noted in Gould's *Uranometria Argentina* A. 5¼ red, B. 7. The star does not occur in D'Agelet, Taylor, or in Argelander's Southern Zones. The mean place for the beginning of the present year is in R.A. 7h. 11m. 31·80s., N.P.D. 113° 6′ 19"·4.

THE TOTAL SOLAR ECLIPSE OF 1878.—In one of the handsomely-executed volumes which issue from the Government Printing Office at Washington, the U.S. Naval Observatory has published the detailed reports of the various expeditions organised for the observation of the total eclipse of the sun on July 29, 1878, which possess a high degree of interest. A large number of wood-engravings and lithographic plates accompany the reports. There is also appended a brief account of the observations made in California during the total solar eclipse of January 11, 1880.

THE EARTHQUAKE OF NOVEMBER 28, 1880, IN SCOTLAND AND IRELAND[1]

THE data on which the paper has been founded have been collected from upwards of fifty stations, and special reliance may be placed on the results, as a large proportion of these stations were lighthouses, in each of which at the time of the occurrence there was a keeper *on watch*, the earthquake having occurred after sunset at a time when the lamps were lighted.

The paper at the outset gave the effects and nature of the shock experienced by various observers at those lighthouse stations where the disturbance was felt.

The data acquired were then discussed, and the following are the general conclusions arrived at:—

1. That the earthquake occurred in November, a month in which many of the British earthquakes are recorded as having happened.

2. That it occurred after a wet and stormy period, which had been preceded by an unusually dry summer and spring; that there was a widespread thunderstorm at the time, and that the barometer was rising slowly over the greater part of the west of Scotland; the average height of the barometer at the lighthouse stations at which the earthquake was felt being at 9 a.m. 29·4 inches, and at 9 p.m. 29·5 inches. The thermometer at 9 a.m. averaged 50° F., and at 9 p.m. 48° F.

3. That the seismal area was about 19,000 square geographical miles, the shock having been felt as far north as the Butt of Lewis, as far south as Armagh in Ireland, as far east as Blair Athole, and as far west as Barra Head Lighthouse, though how much farther it was propagated into the Atlantic it is impossible to say.

4. That the range of the earthquake or distance to which the wave was propagated was greater over the sea than over the land.

5. That the earthquake was not a simultaneous shake over the disturbed area, but was produced by a wave propagated from a centre.

6. That the undulation seems to have been chiefly of an "up and down" character like a wave of the sea, and that calculating the "breadth" from the mean velocity of transit and the minimum duration of the shock, the wave appears to have been fully 1100 feet "broad."

7. That the observations warrant the assumption that a spot near Phladda Lighthouse (north-east of Colonsay) was the source, and calculating the velocities of transit with a point 13 miles south-south-west of Phladda Lighthouse as a centre, it appears that the wave travelled with a greater velocity over the sea-basin than over the land, probably due to the fact that over the sea there was a thinner and lighter crust to throw into vibration; the average velocity on sea journeys being 6·74 geographical miles per minute, and the average velocity on land journeys 4·65 miles per minute, the mean of the whole being about 5¾ miles per minute.

8. That the source of the earthquake lay at or near the great

[1] By Charles Alex. Stevenson, B.Sc., Edinburgh, communicated to the Royal Society of Edinburgh by Prof. Geikie, F.R.S., March 21, 1881.

fracture of the earth's crust which runs in a south-westerly direction from Inverness.

9. That all the observers who heard the noise agree in stating that it was a "rumbling" sound.

10. That of the fourteen observers within 38 miles of the source who felt the shock, thirteen of them mention having heard the rumbling noise, and none of the other observers in Scotland mention noise as an accompaniment of the earthquake, and hence that the noise was confined chiefly, if not entirely, to places situated near the source.

11. That the stations where the noise was heard were for the most part situated on hard dense rocks, with little or no soil near them.

12. That the average duration of the disturbance was 4·4 seconds for observers situated within the sound area.

13. That of twenty-two lighthouse observers between Cape Wrath and the Mull of Galloway who were situated on the older formations (Laurentian, Cambrian, and metamorphosed Lower Silurian) eleven felt the shock, whilst of thirteen observers situated on newer rocks it made itself known only to two of them, and that the earthquake was therefore more generally felt on the older rocks of Scotland.

14. That stations situated near one another and on the same formation did not necessarily both receive the shock, and that faults and trap dykes did not seem to affect the passage or intensity of the wave in any way.

15. That the observations of time at Armagh, Belfast, and Omagh show that the shocks at these places were most probably propagated direct from Phladda in Scotland, and that the severity of the shock and the "rumbling" noises heard in and around Leterkenny were probably due to a second and local source of disturbance generated by the arrival of the shock from Phladda.

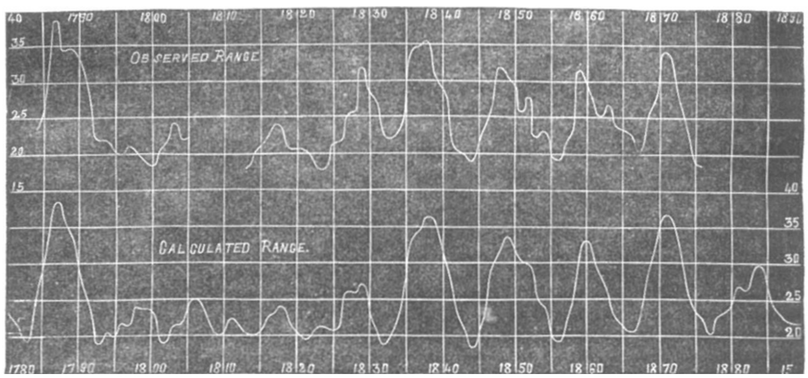
MAGNETIC DECLINATION [1]

1. IT is well known that Prof. Rudolph Wolf has endeavoured to render observations of sun spots made at different times, and by different observers, comparable with each other, and has thus formed a list exhibiting approximately the relative sun-spot activity for each year. This list extends back into the seventeeth century, and is unquestionably of much value. Nevertheless it must be borne in mind that we possess no sun-spot data sufficiently accurate for a discussion in a complete manner of questions relating to solar periodicity before the time when Schwabe had finally matured his system of solar observations, which was not until the year 1832.

We have however a much longer series of the diurnal ranges of magnetic declination. Now these are already well known to follow very closely all the variations of sun-spot frequency, being greatest when there are most, and least when there are fewest spots; and it may even be imagined that such ranges give us a better estimate of true solar activity than that which can be derived from the direct measurement of spotted areas.

The long-period inequalities of the diurnal range of magnetic declination are thus, we may imagine, precisely those of solar activity, so that to analyse the former is probably equivalent to analysing the latter.

2. Our method of analysis is not new. The system pursued by us is in fact that which has been pursued by Baxendell, and



probably other astronomers, with observations of variable stars, and it has already been applied by one of us in a preliminary manner to magnetic declination ranges (*Proc.* Lit. and Phil. Society, Manchester, February 24, 1880).

3. The observations at our disposal are those which have been used by Prof. Elias Loomis in his comparison of the mean daily range of the magnetic declination with the extent of the black spots on the surface of the sun (*American Journal of Science and Arts*, vol. l., No. cxlix.). These observations are recorded as monthly means of diurnal declination range, and we found it necessary to multiply each by a certain factor, firstly, on account of the well-known annual inequality of declination range, and secondly, to bring them all to the standard of the Prague observations. We have applied for this latter purpose precisely the same corrections as those made by Prof. Loomis.

4. The result of an analysis of these observations has been to indicate the existence of three inequalities: two dominant ones with periods of about $10\frac{1}{2}$ and 12 years, and a subsidiary one with a period of about $16\frac{1}{4}$ years. By these means we have beeen enabled to reproduce the observed annual values of declination range with an average difference of 39″. The amount of agreement between the observed and calculated values will be seen from a diagram which accompanies this note. We are however of opinion that the series of observed values at present obtainable is too short to render this analysis a very accurate one. It will certainly not bear carrying back forty or fifty years beyond its starting-point, which was in 1784, and it would be very hazardous to carry it forward any considerable length into the future. We may however mention that our calculations indicate a maximum of declination range about 1884, but not so pronounced a maximum as that of 1871.

5. During our analysis an observation was made by us which we think worthy of record.

It is a well-known fact that the so-called eleven-yearly oscillations of declination range are at certain times large, and at other times small. Thus, for instance, they have been large for the last forty years, but they were small about the earlier part of the present century. It is clear to us from an inspection of the observations that a series of large oscillations is accompanied with an exaltation of the base line, or line denoting average efficiency, while a series of small oscillations is accompanied with a depression of the same. The result is a long period curve of the base line, the beat period, so to speak, of the eleven-yearly inequality.

Now a phenomenon precisely similar occurs in connection with shorter periods. If we take inequalities having a period of three or four months we find that such are alternately well developed or of large range, and badly developed, or of small range; and that a large range of such is accompanied with an exaltation of the base line or line of average efficiency, while a small range is accompanied with a depression of the same. The result is a curve of the base line, of which the period is, roughly speaking, eleven years. May we not therefore imagine that the so-called eleven-yearly period, or, to speak more correctly, the

[1] "Note on an Attempt to Analyse the Recorded Diurnal Ranges of Magnetic Declination." By Balfour Stewart, M.A., LL.D., F.R.S., Professor of Natural Philosophy at the Owens College, and William Dodgson. Read at the Manchester Literary and Philosophical Society, March 8.